What is claimed is:

1. A performance monitoring of offshore petroleum risers using optical strain sensors for measuring the strain, vortex induced vibration (viv) and temperature in steel and composite offshore risers using advanced fiber optics technology, comprising:

means for measuring axial strains and temperature in the metal or composite tube;

means for measuring circumferential stains and temperature in the tube;

means for protecting the optical fiber from damage from operations in the marine environment;

means for measuring the strain anomolies and concentrations in the end coupling;

means for provide a junction box for optical fibers;

means for generating back to back strain measurements for the purpose of calculating bending strains in the tube; and

means for amplifying the sensitivity of the

optical strain gage measurement by using several loops of the opitcal fiber from one end of the tube to the other.

2. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for measuring axial strains and temperature in the metal or composite tube. comprises an Optical Time Domain Reflectrometry , Bragg Diffraction Grating axial optical fiber in body of tube.

3. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for measuring circumferential stains and temperature in the tube. comprises an Optical Time Domain Reflectrometry , Bragg Diffraction Grating circumferential optical fiber.

4. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for protecting the optical fiber from damage from operations in the marine environment, comprises a Polymeric protective outer layer and fluid barrier.

5. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for measuring the strain anomolies and concentrations in the end coupling, comprises an Optical Time Domain Reflectrometry , Bragg Diffraction Grating optical fiber in metal to composite end coupling.

6. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for provide a junction box for optical fibers, comprises a fiber optics connection box.

7. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for generating back to back strain measurements for the purpose of calculating bending strains in the tube. comprises a longitudinal fiber optics circumferential spacing.

8. The performance monitoring of offshore petroleum risers using optical strain sensors in accordance with claim 1, wherein said means for amplifying the sensitivity of the optical strain gage measurement by using several loops of the opitcal fiber from one end of the tube to the other. comprises an Optical Time Domain Reflectrometry , Bragg Diffraction Grating axial optical fibers looped end to end.

9. A performance monitoring of offshore petroleum risers using optical strain sensors for measuring the strain, vortex induced vibration (viv) and temperature in steel and

composite offshore risers using advanced fiber optics technology. comprising:

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating axial optical fiber in body of tube, for measuring axial strains and temperature in the metal or composite tube.;

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating circumferential optical fiber, for measuring circumferential stains and temperature in the tube.;

a Polymeric protective outer layer and fluid barrier, for protecting the optical fiber from damage from operations in the marine environment.;

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating optical fiber in metal to composite end coupling, for measuring the strain anomolies and concentrations in the end coupling.;

a fiber optics connection box, for provide a junction box for optical fibers.;

a longitudinal fiber optics circumferential spacing, for generating back to back strain

measurements for the purpose of calculating bending strains in the tube.; and

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating axial optical fibers looped end to end, for amplifying the sensitivity of the optical strain gage measurement by using several loops of the opitcal fiber from one end of the tube to the other.

10. A performance monitoring of offshore petroleum risers using optical strain sensors for measuring the strain, vortex induced vibration (viv) and temperature in steel and composite offshore risers using advanced fiber optics technology. comprising:

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating axial optical fiber in body of tube, for measuring axial strains and temperature in the metal or composite tube.;

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating circumferential optical fiber, for measuring circumferential stains and temperature

in the tube.;

a Polymeric protective outer layer and fluid barrier, for protecting the optical fiber from damage from operations in the marine environment.;

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating optical fiber in metal to composite end coupling, for measuring the strain anomolies and concentrations in the end coupling.;

a fiber optics connection box, for provide a junction box for optical fibers.;

a longitudinal fiber optics circumferential spacing, for generating back to back strain measurements for the purpose of calculating bending strains in the tube.; and

an Optical Time Domain Reflectrometry , Bragg Diffraction Grating axial optical fibers looped end to end, for amplifying the sensitivity of the optical strain gage measurement by using several loops of the opitcal fiber from one end of the tube to the other.

11. A performance monitoring system for spoolable composite pipe using optical strain sensors for measuring the strain and temperature using advanced fiber optics technology comprising:

means for measuring the axial and circumferential strain in the spoolable composite tube; and

means for measuring the temperature in the spoolable composite tube.

12. The performance monitoring of spoolable composite pipe using optical strain sensors in accordance with claim 11, wherein said means for measuring axial and circumferential strains comprises an Optical Time Domain Reflectrometry axially oriented optical fiber integrated into the body of the spoolable pipe during manufacture.

13. The performance monitoring of spoolable composite pipe using optical strain sensors in accordance with claim 11, wherin said means for measuring temperature comprises a Bragg Diffraction Grating integrated into the body of the spoolable composite pipe during manufacture.